

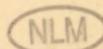
THE RELATIONSHIP OF THE SO-CALLED TRACHOMA BODIES TO CONJUNCTIVAL AFFECTIONS.

BY HIDEYO NOGUCHI, M.D.  
AND  
MARTIN COHEN, M.D.



THE RELATIONSHIP OF THE SO-CALLED TRACHOMA BODIES TO CONJUNCTIVAL AFFECTIONS.<sup>1</sup>

BY HIDEYO NOGUCHI, M.D.  
AND  
MARTIN COHEN, M.D.



PATHOLOGICAL AND BACTERIOLOGICAL STUDIES WERE CONDUCTED BY DR. NOGUCHI AT THE LABORATORIES OF THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, N. Y.

(With five illustrations on Text-Plates I. and II.)

THIS study was first undertaken by us a year ago with the purpose of investigating the relationship of the so-called trachoma bodies to conjunctival diseases. A paper giving an historical review of these so-called trachoma bodies and a description of the method of making smears and sections for their detection has already been published by us.<sup>2</sup> In the present study Dr. Noguchi personally examined over 10,000 smears and sections in the following conditions:<sup>3</sup>

---

<sup>1</sup> Read before the Ophthalmological Section N. Y. Academy of Medicine, Nov. 21, 1910.

<sup>2</sup> *Transactions of the Pathological Soc. of N. Y.*, 1910, vol. x., p. 20.

<sup>3</sup> The cases on which this study is based were derived not only from Dr. Cohen's service at the Randall's Island Hospital and from the Harlem Hospital, but also through the courtesy of the following gentlemen, to whom we wish to express our indebtedness: Dr. George W. Stoner, Chief Medical Official at Ellis Island; Dr. Albert N. Wiggleworth, Medical Officer at the Indian Reservation, Fort Defiance, Arizona; Dr. Arnold Knapp, New York Ophthalmic and Aural Institute; Dr. C. W. Cutler and staff, New York Foundling Asylum; Dr. H. W. Wootton, Manhattan Eye and Ear Hospital; Dr. J. M. Wheeler, New York Eye and Ear Infirmary; and Dr. V. C. Pedersen, Genito-Urinary Department, Hudson Street Hospital.

- 1st, Normal conjunctiva of the new-born (white).
- 2d, Normal conjunctiva of the new-born (colored).
- 3d, Conjunctivitis catarrhalis (acuta).
- 4th, Conjunctivitis catarrhalis (chronica).
- 5th, Conjunctivitis associated with measles, scarlatina, and diphtheria.
- 6th, Conjunctivitis, due to foreign bodies on the conjunctiva or cornea.
- 7th, Conjunctivitis, due to atropine.
- 8th, Conjunctivitis vernalis.
- 9th, Folliculosis conjunctivæ.
- 10th, Conjunctivitis follicularis.
- 11th, Trachoma      

{	hypertrophic or granular.
	cicatricial
	acute type? or mixed infections?
- 12th, Blennorrhœa neonatorum gonorrhœica.
- 13th, Blennorrhœa neonatorum non-gonorrhœica.
- 14th, Blennorrhœa gonorrhœica in adults.
- 15th, Blennorrhœa gonorrhœica in children.

In order to study morphologically and culturally the relationship claimed by Herzog to exist between the gonococcus and the so-called trachoma bodies, numerous smears were taken from the male urethra in various stages of gonorrhœal urethritis and from the vagina in gonorrhœal vaginitis. This phase of the subject is still under investigation by Dr. Noguchi. Smears were also taken from the cervix and urethra of three mothers whose children had blennorrhœa neonatorum non-gonorrhœica but the bodies were not found. In smears made from the accessory lachrymal gland and sac in three cases of chronic trachoma the bodies were absent.

In the first nine classes of cases above enumerated the so-called trachoma bodies were uniformly absent.

*Folliculosis conjunctivæ* is the term applied by Saemisch to the non-inflammatory, non-communicable condition in which minute superficial isolated follicles are scattered over the lower conjunctiva. These follicles show no tendency to increase in size and number, and after months or years disappear regardless of treatment, leaving no trace of their previous existence on the conjunctiva. In the 30 cases of

TO ILLUSTRATE DRs. NOGUCHI AND COHEN'S ARTICLE ON TRACHOMA.

Preparations by Dr. Noguchi.

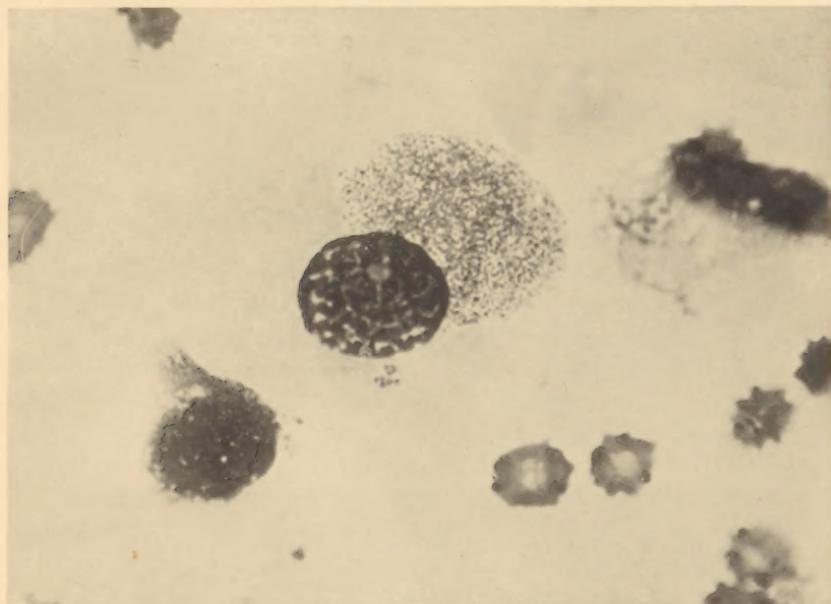


FIG. 1.

Last developmental stage of trachoma bodies, with very little plastin mass.

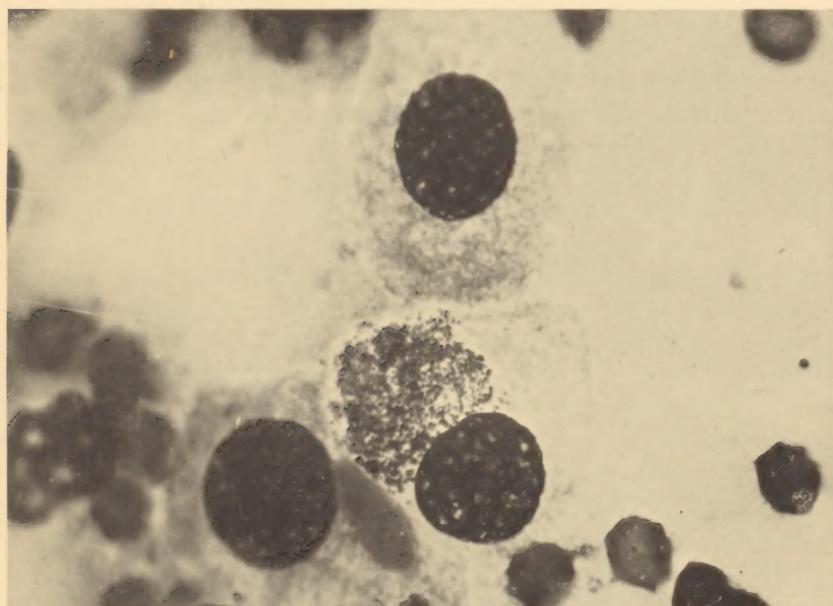


FIG. 2.

Moderately grown trachoma bodies, showing plastin mass and elementary granules.



folliculosis conjunctivæ studied no so-called trachoma bodies were found.

*Conjunctivitis follicularis* is to be distinguished from the above and, according to most authorities, is a chronic progressive communicable inflammation of the conjunctiva characterized by the presence of follicles usually situated in the lower conjunctiva, these follicles afterwards gradually spreading to the upper folds and caruncles, and lastly in the terminal stage to the upper tarsal conjunctiva. After increasing in size and number these follicles coalesce to form lymphoid masses in the folds, these masses ultimately becoming absorbed and leaving the conjunctiva apparently normal. At a certain stage of this cycle, the process temporarily becomes stationary in many of these cases; for instance, numerous follicles may remain discrete and become absorbed instead of coalescing. In the great majority of these cases, in which there was no clinical resemblance to typical trachoma, no so-called trachoma bodies were found. The results of animal inoculations in this type of cases will be reported by Dr. Noguchi at some future date.

Of the 250 cases studied, 66 were of a marked type; these occurred principally in children, and might be spoken of as borderland cases, since clinical differentiation from trachoma was impossible. The so-called trachoma bodies were found in 9 of these 66 cases; in the remaining 57, repeated and careful search in both smears and sections failed to reveal any bodies. These severe cases, observed for periods varying from one to several years and including those in which the so-called trachoma bodies were found, have not been followed by pannus and scar-tissue formation, though from time to time granules reappeared in spite of expression and post-operative treatment. The expression operation accomplishes escape of the lymphoid secretion from the follicles, but the hard reddish granules beneath and between the follicles are not thus removed. This failure to displace by normal or cicatricial tissue these sand-like bodies is probably an important factor in the frequent recurrences. When there is a granular appearance of the conjunctiva associated with an acute catarrhal inflammation, e.g., an acute catarrhal conjunctivitis superimposed upon a conjunctivitis follicularis, the probabil-

ity of a mixed infection must be borne in mind; the history and bacteriological examination will be of aid in such a contingency.

*Trachoma.*—Trachoma is a chronic communicable inflammation of the conjunctiva evidenced by the gradual formation of granules or papules or both, or by a diffuse hypertrophy of the conjunctiva; these conditions usually resulting in superficial or deep cicatrization of the conjunctiva with or without pannus. The medical profession has long sought some positive clinical characteristic or some definite laboratory aid which would serve to differentiate incipient trachoma from the other conjunctival affections simulating it. When Halberstaedter and v. Prowazek and Greeff in 1907 announced the discovery of certain cell inclusions, which they regarded as the efficient cause of the disease, our present work was started with the view of corroborating or refuting this deduction.

In 60 cases of typical trachoma, as evidenced by hypertrophy, cicatrization, or pannus, smears from the conjunctiva were made and so-called trachoma bodies were present in 36, or 60%, of the cases. The bodies were found in 12 out of 15 cases in American Indians. Post-operative cases as well as those under recent treatment with the copper stick are included. In several cases in which the affected conjunctival tissue was removed as a therapeutic procedure, the tissues were prepared for animal inoculation immediately after ablation; the results will be published later by Dr. Noguchi.

The experience with families, some of whose members were affected with trachoma, and the observation in institutions in which the disease was prevalent, have enabled us to study the communicability of this disease, the clinical course which it follows almost from its inception, and the frequency of the so-called trachoma bodies in those affected. All of these cases which were of a rather acute type, 14 in number, showed the presence of the so-called trachoma bodies. In some of the early cases observed, the entire conjunctiva during the first week was congested and swollen and showed slight mucoid secretion and medium-sized follicles in the lower folds. These follicles increased gradually in size and number

TO ILLUSTRATE DRs. NOGUCHI AND COHEN'S ARTICLE ON TRACHOMA.

Preparations by Dr. Noguchi.

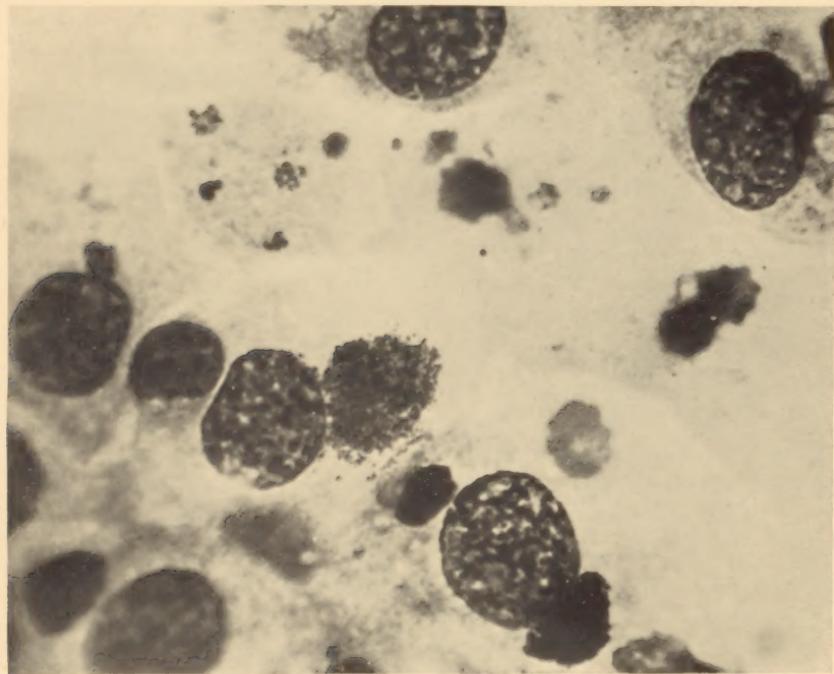


FIG. 3.

Initial stages of trachoma bodies, and somewhat advanced stages.  
Multiple infection.

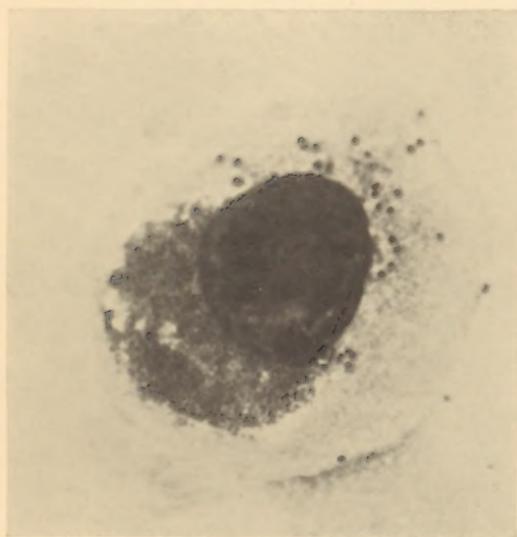


FIG. 4.

Trachoma body in blennorrhœa gonorrhœica in children.  
Simultaneous presence of regular gonococci and  
trachoma granules in one epithelium.

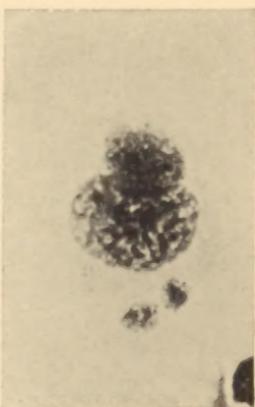


FIG. 5.

Trachoma bodies in blennorrhœa gonorrhœica  
in children.  
Showing typical trachoma  
bodies.



for the following three weeks and covered the tarsal conjunctiva, giving it a sand-like appearance. This condition remained stationary in some cases for several months and then the process retrograded, the follicles on the upper tarsal conjunctiva became absorbed, the congestion diminished, and finally the lower conjunctiva, after exhibiting the sand-like appearance above referred to, became restored to normal. The usual time required for this resumption of a normal appearance was three or four months, though in some cases the time was much longer. In two cases which have been under observation for eight months a finely granular appearance of the lower conjunctiva is still present. Only mild therapeutic measures were employed except in those few cases showing no tendency to ameliorate. In two cases with acute manifestations, in which the bodies were present, the inflammation involved only one eye, but showed the same course as in the bilateral cases just described. The fact that in 12 of these 14 cases there was complete restoration of the conjunctiva to normal without pannus or cicatrization would seem to indicate the existence of a conjunctival affection pathologically independent from trachoma though clinically simulating this disease for a certain period. Whether the bodies which were constantly associated with this affection are its sole cause remains for future investigation to determine.

Of 11 cases of trachoma in children, with pannus and cicatrization, the bodies were found in 7 of the cases.

In a case of conjunctivitis follicularis in which smears failed to show the bodies, there suddenly supervened an acute catarrhal inflammation of the conjunctiva. On the nasal side of the left bulbar conjunctiva near the limbus, there also appeared a small patch of spawn-like tissue. Separate smears taken from the inflamed conjunctiva and the patch revealed the so-called trachoma bodies. In two weeks the inflammation subsided and the infiltrated area in one eye disappeared; smears taken as before at this time and two weeks later were negative.

The only complication seen with these acute manifestations was a temporary partial ptosis of one eye in two cases.

*Blennorrhœa neonatorum gonorrhœica.*—All the 12 cases had the characteristic features of this disease. Only one smear

was made from each case and this in the early stages of the disease; gonococci were uniformly present, the bodies uniformly absent.

*Blennorrhœa neonatorum non-gonorrhœica*.—Six cases of this disease were studied, their ages ranging from four days to two weeks; the bodies were found at periods varying from four days to two weeks after birth. In one case the bodies were regularly found as late as three months after birth. The clinical appearance of these cases resembled mild cases of blennorrhœa gonorrhœica, which in its earliest stage is characterized by a diffuse conjunctival congestion with a mucoid secretion from the conjunctiva. This condition remains about one week, when the conjunctiva assumes a papillary appearance and a few follicles are seen on the upper fold as well as on the lower. This papillary appearance lasts about two months, when the process regresses simultaneously with the gradual disappearance of the bodies and the return of the conjunctiva to normal in three to four months.

In one of these cases the conjunctiva was more congested than in the other five and there was present on both upper tarsal conjunctivæ a pseudo-membrane. This patient, after two weeks in the Maternity Ward, was taken home; three days later the mother returned with the child, the condition in the child's eye slightly improved, but in the mother the conjunctiva of one eye was slightly congested with a few follicles present and a slight mucoid secretion. A conjunctival smear from the mother's affected eye revealed the presence of so-called trachoma bodies, and these were found at intervals for three months. One week after the original involvement in the mother's eye, her other eye, previously normal and free from bodies, became similarly affected. The clinical course in this case was similar to those observed in acute manifestations simulating trachoma. The total duration was about five months; the cornea remained clear, and with the exception of a few fine granules in the lower conjunctival fold the appearance of the conjunctiva was normal.

*Blennorrhœa gonorrhœica in adults*.—There were four cases with typical appearances. One smear was made in each instance and this revealed only the presence of the gonococcus.

*Blennorrhæa gonorrhœica in children.*—In an epidemic at the Randall's Island Hospital in January, 1910, there were 13 cases of blennorrhœa gonorrhœica all occurring in the same pavilion. Conjunctival smears uniformly showed the gonococcus but no so-called trachoma bodies.

In a second epidemic occurring five months later in the same pavilion, there were 30 cases of this disease in girls from five to fifteen years of age. After 6 cases had developed, these and the successive cases were transferred to another ward until within a few days there were 30 patients isolated, all of whom had a marked ophthalmia evidenced by intense edema of the lids, pyorrhea, a diffuse congestion and folding of the conjunctiva, and, in a few cases, a necrotic membrane covering the tarsal conjunctiva. Vaginal smears taken at the outset showed the gonococcus but no bodies in 6 of the cases. Conjunctival smears in all of the cases showed both gonococci and so-called trachoma bodies, but the irregularity of their discovery and the inconstancy of their association were noteworthy. For four months smears were taken repeatedly at intervals of a few days. Sometimes there would be found gonococci alone, at other times so-called trachoma bodies alone, and occasionally both gonococci and bodies. Towards the end of the illness naturally the gonococci were less numerous and frequent, but the bodies persisted even after practical cure of the disease. One case constituted an exception to the above findings in that gonococci alone were found throughout the course of the disease, though clinically the case was similar to the other 29. The course of these cases resembles that of blennorrhœa gonorrhœica as seen in adults, the papillary stage of which is hardly distinguishable from trachoma. In most of our cases after regression from the papillary stage of the disease, the conjunctiva became normal in from three to four months. In several of the cases there is still slight congestion of the lower conjunctiva and a few fine granules are present in the folds. The cornea was free from infection in 28 of our cases; of the remaining 2, one already had a perforating ulcer when placed under our care, and the other developed a small perforating ulcer while under treatment. It might be instructive, owing to the gravity of the condition and the results obtained, to note the treat-

ment employed, which consisted of application to the lids of ice compresses, boric acid irrigations given almost continuously with the fountain syringe, and between the irrigations cleansing the accessible conjunctiva with gauze moistened with boric acid. This treatment was carried out night and day by a corps of nurses, and no other medication was employed.

We present the results of our findings of so-called trachoma bodies in different conjunctival affections in the following table.

Name of Conjunctival Affections.	No. of cases.	So-called trachoma bodies.		Gono-cocci found.
		Found.	Not found.	
1st, Normal conjunctiva of the new-born (white)	25	0	25	
2d, Normal conjunctiva of the new-born (colored)	10	0	10	
3d, Conjunctivitis catarrhalis (acuta)	30	0	30	
4th, Conjunctivitis catarrhalis (chronica)	10	0	10	
5th, Conjunctivitis associated with measles, scarlatina, and diphtheria	18	0	18	
6th, Conjunctivitis due to foreign bodies on conjunctiva or cornea	6	0	6	
7th, Conjunctivitis due to atropine	2	0	2	
8th, Conjunctivitis vernalis	11	0	11	
9th, Folliculosis conjunctivæ	30	0	30	
10th, Conjunctivitis follicularis	250	9	241	
11th, Trachoma	{ hypertrophic or granular cicatricial acute type? or mixed infections	60	36	24
		9	4	5
12th, Blennorrhœa neonatorum gonorrhœica	14	14	0	
13th, Blennorrhœa neonatorum non-gonorrhœica	12	0	0	12
14th, Blennorrhœa gonorrhœica in adults	16	6	10	
15th, Blennorrhœa gonorrhœica in children	4	0	0	4
	43	29	14	43

## CONCLUSIONS.

The following conclusions may be drawn from our bacteriological findings and clinical observations:

1. The uniform absence of the so-called trachoma bodies in the first nine groups of cases disproves the theory that the bodies are merely the result of local irritation, be it mechanical, chemical, inflammatory, or toxic.
2. The absence of the bodies in all but 9 of the 250 cases of conjunctivitis follicularis shows that they are rarely associated with this disease.
3. The frequent but inconstant presence of these bodies in *trachoma*, *blennorrhæa neonatorum non-gonorrhœica*, and *blennorrhæa gonorrhœica in children*, is an associated phenomenon whose exact etiological significance in these diseases remains to be solved by future investigations.

*The finding of the bodies in the conditions mentioned above suggests to us the hypothesis that the so-called trachoma bodies represent an etiological factor in an independent conjunctival affection which is not complicated by pannus or cicatrization and which clinically resembles trachoma with acute manifestations or the papillary stage of blennorrhæa gonorrhœica. On this hypothesis the presence of the so-called bodies in trachoma and in blennorrhæa gonorrhœica is to be interpreted as the result of the engrafting of the disease caused by these bodies on the original affection.*









The Knickerbocker Press, New York